

The Quality Assurance Role in the Deep Space Network

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Quality Assurance — Ground Data Systems Section

The following is presented as an informative description of the Quality Assurance role, to the Cognizant Engineering and Project personnel assigned to the Deep Space Network.

I. Introduction

The Quality Assurance — Ground Data Systems Section, has played an important role in providing quality engineering and inspection support to the Deep Space Network operations since 1964, as illustrated in Figs. 1 through 15.

In this role, the Quality Assurance Section provides skilled personnel who perform the following functions: quality hardware engineering, quality software engineering, inspection and testing, and an independent assessment to quality, engineering and project requirements. This has proven to be cost effective to the TDA-DSN operations.

By proper training, quality engineering, inspection, auditing, and verifying conformance in a timely manner, the Quality Assurance Section has performed a meaningful task in providing technical capabilities to assure equipment reliability for performance in the Deep Space Network.

II. Program Plan

Document PP15151-1 (JPL internal document), *Quality Assurance Program for the Deep Space Network*, approved by the Office of Tracking and Data Acquisition, defines the Quality Assurance Section's role and responsibilities.

III. Budget Guidelines/Resources

The TDA Budget Guidelines provide the description and resources for the Quality Assurance Section to support hardware and software requirements.

IV. Project Management Plans

A Quality Assurance Task Manager is assigned to develop and implement a Quality Assurance Management and Program Plan in support of each project for the Deep Space Network.

V. TDA Representation

The Quality Assurance Section Manager attends the weekly TDA meeting as a participating member in representing the Quality Assurance Section for problem solving recommendations.

VI. Quality Assurance Engineering and Planning

The Quality Assurance Section provides specifications, workmanship standards, process specifications and quality assurance procedures in support of DSN equipment.

In addition, the Quality Assurance Section reviews DSN Engineering documents to ensure that appropriate and adequate quality provisions are included (Ref. 1).

VII. Procurements/Work Orders

The DSN Quality Assurance Representative reviews statements of work, purchase requisitions and work orders for appropriate quality provisions for implementation.

To be cost effective and without compromising quality, quality requirements are tailored to fit the item being manufactured or purchased.

VIII. Vendor Surveys

Quality Assurance personnel perform surveys with Engineering and Procurement to determine contractor capabilities for all types of hardware; approvals, conditional approvals or disapprovals are documented.

IX. Cables/Harnesses

Cables and harnesses are inspected at the source and JPL. Electrical tests are performed 100 percent. These tests have proven to be effective by assuring that cables are reliable, thus reducing the requirement for spares in the Deep Space Network.

X. Mechanical Inspection

Quality Engineering and inspection support vendors, JPL, and the DSN Stations. In-house mechanical inspection equipment is utilized in checking dimensions and characteristics with Engineering drawings.

At the DSN Stations some of the most important factors are checking alignments of panels, and inspection of structures to verify adherence to requirements.

The Mechanical Inspection Department also has metrology equipment and provides calibration of mechanical tooling.

XI. Quality Hardware Engineering

The Quality Assurance Section provides capable and qualified Engineering personnel to assist technical engineers in determining design and fabrication requirements.

XII. Inspection Personnel

The Quality Assurance Section provides inspection personnel to perform inspections in accordance with quality engineering and technical engineering requirements.

XIII. Quality Software Engineering

Quality Assurance Software Engineering provides independent audit of design, audit of code versus design, audit of test plans versus requirements, and audit of test results.

XIV. Receiving/On-Lab Inspections

The Quality Assurance Section provides inspection support for the receiving inspection areas and the various labs where DSN hardware is fabricated and tested.

XV. Transfer Agreements

The Quality Assurance Section reviews all transfer agreements for both hardware and software.

Quality assurance supporting inspection documentation is utilized to verify conformance to engineering and quality requirements in support of transfer agreements.

XVI. Audits

Audits for conformance to quality requirements are performed periodically at both the contractor and JPL facilities. Corrective actions are requested when required based on findings.

XVII. Workmanship Assurance (W.A.) Program

The Quality Assurance Section provides a coordinator to the W. A. Program Office for purposes of auditing to JPL requirements and to ensure conformance to TDA-DSN requirements.

XVIII. Documentation

The Quality Assurance Section maintains records for all activities performed in support of DSN requirements. Records are microfilmed after one year for retention. AODC and ACS are utilized in distributing various reports to cognizant personnel.

XIX. Training and Certification Programs

The JPL Quality Assurance Training and Certification Program provides real-time courses and video related programs with qualified and certified instructors in the proper techniques of hand soldering, cabling and harnessing, wire wrap, cable repair, I. C. replacement, P. C. module repair, and flat ribbon cable.

A certification is issued to each successful attendee.

Instructors at the Deep Space Stations are certified and qualified by the JPL Quality Assurance Instructors.

Video tapes are provided to the DSN Stations and to other NASA centers.

XX. Progress Reports

Monthly progress reports are distributed to TDA and DSN cognizant personnel to inform them of current status of hardware and software.

Reference

1. DSN Standard Procedure, DP512360. Jet Propulsion Laboratory, Pasadena, Calif. (JPL internal document).



Fig. 1. Receiving inspection of DSN equipment



Fig. 3. Metrology and gage calibration



Fig. 2. Leveling out blocks for site erection of quadripod in Spain



Fig. 4. Rotab plate-check inspection of in-house fabricated part



Fig. 5. Checking precision piece parts on Intra-Ron for roundness, flatness, and perpendicularity



Fig. 7. Use of optical comparator for inspection of precision machine parts



Fig. 6. Use of XYZ automated measuring equipment



Fig. 8. Electrical testing of cables



Fig. 9. Electrical testing of hardlines



Fig. 11. Inspection of cabinet assembly at CTA-21



Fig. 10. Screening of purchase requisitions, drawings, and specifications for implementation of quality assurance requirements



Fig. 12. Auditing software code to engineering documentation



Fig. 13. Developing and producing video training and certification programs in electrical and mechanical assembly for JPL and DSN stations



Fig. 15. Training classes are periodically audited for conformance to requirements by supervision and management



Fig. 14. Instructor demonstrating correct method of electronic assembly